

# Drought in Colorado: Impacts, Planning and Lessons Learned

Drought: Yesterday, Today, and Tomorrow

Water Resource Institute,  
California State University,  
November 2002



By Jack Byers

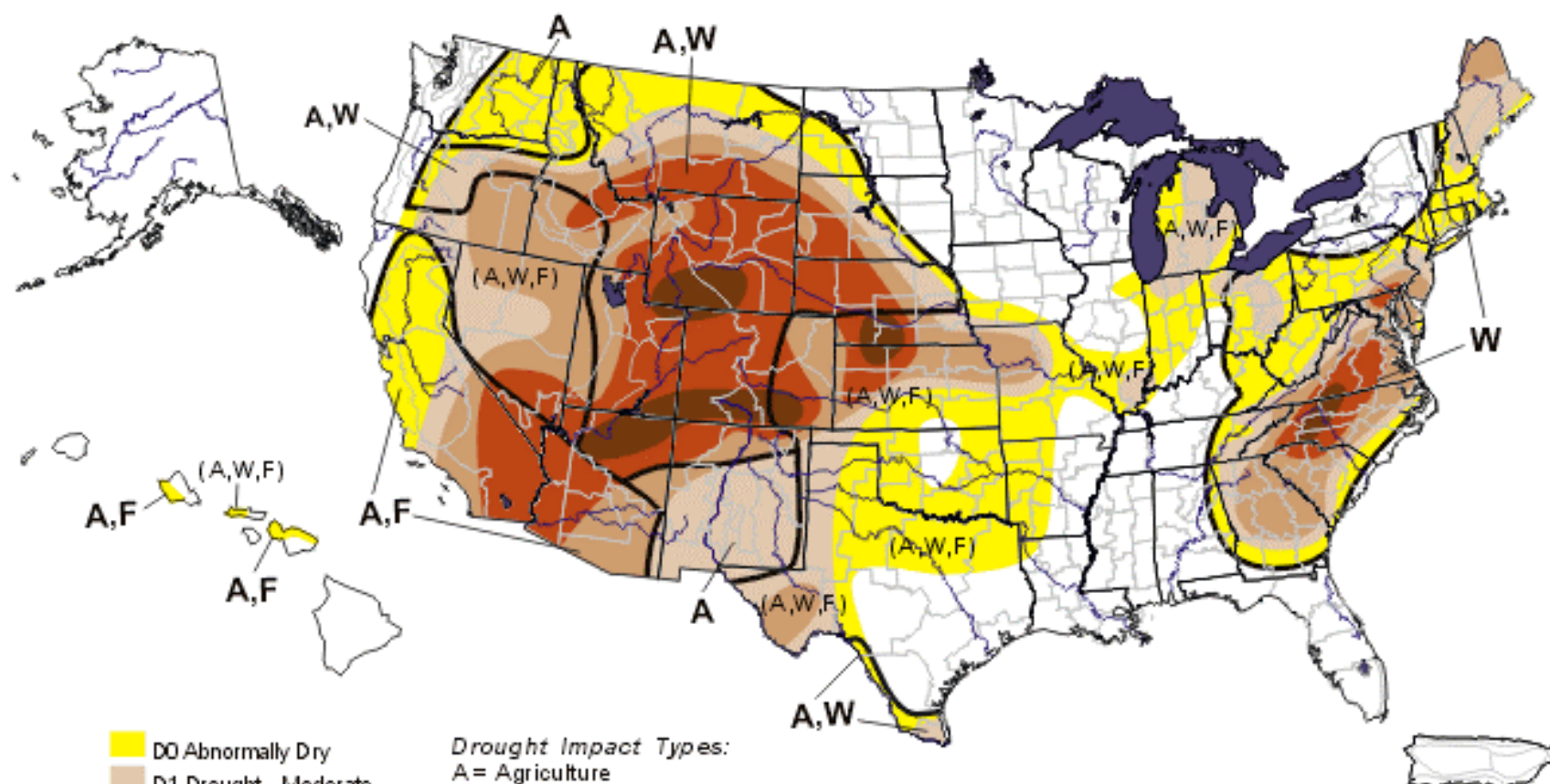
Asst. State Engineer

Vice Chair, Gov. Water  
Availability Task Force

# U.S. Drought Monitor

October 1, 2002

Valid 8 a.m. EDT



- D0 Abnormally Dry
- D1 Drought—Moderate
- D2 Drought—Severe
- D3 Drought—Extreme
- D4 Drought—Exceptional

#### Drought Impact Types:

- A = Agriculture
- W = Water (Hydrological)
- F = Fire danger (Wildfires)
- Delineates dominant impacts
- (No type = All 3 impacts)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

<http://drought.unl.edu/dm>



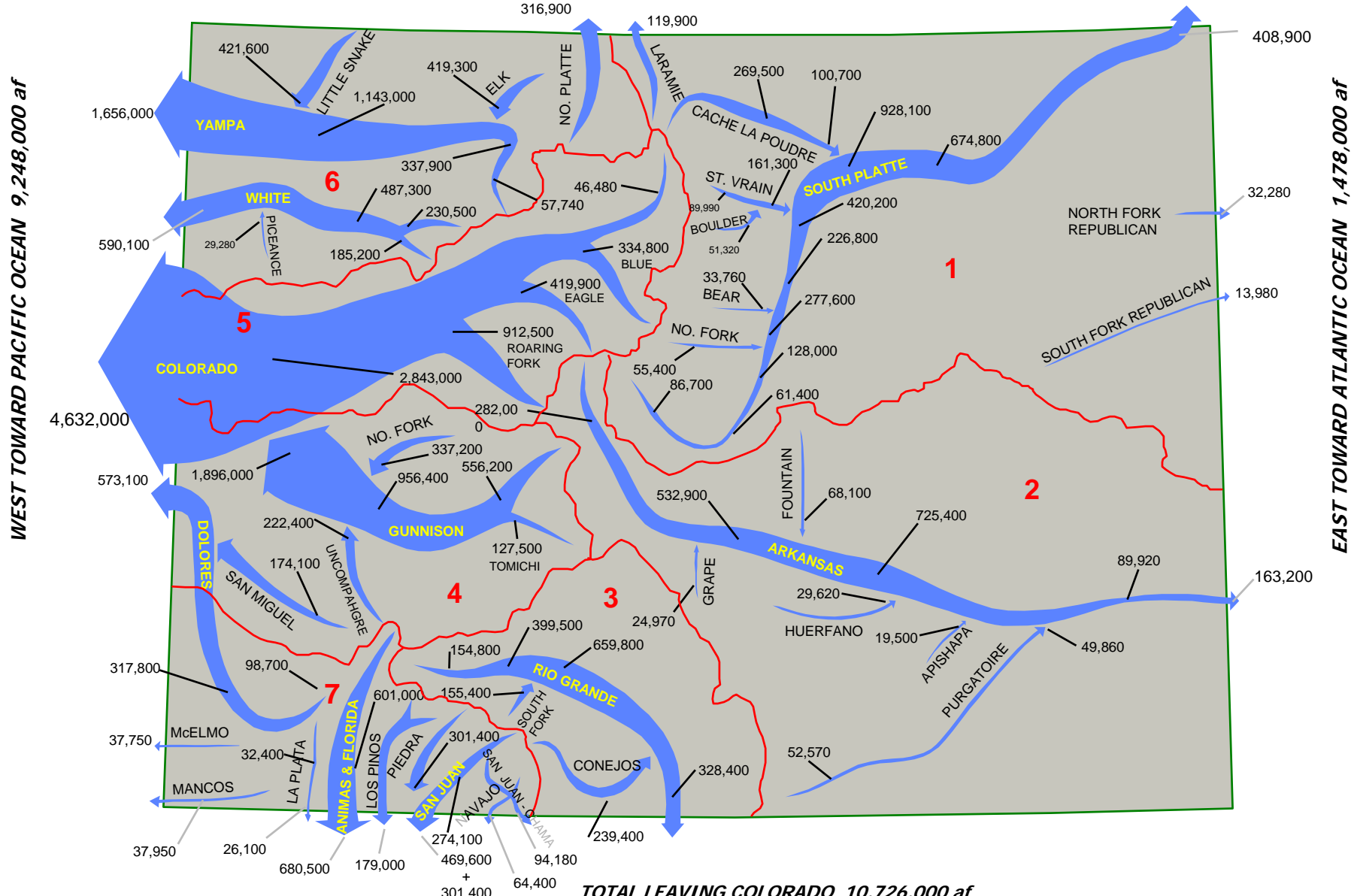
**Released Thursday, October 3, 2002**

**Author:** Rich Tinker, CPC/NCEP/NWS/NOAA



# COLORADO HISTORIC AVERAGE ANNUAL STREAM FLOWS

(acre feet)

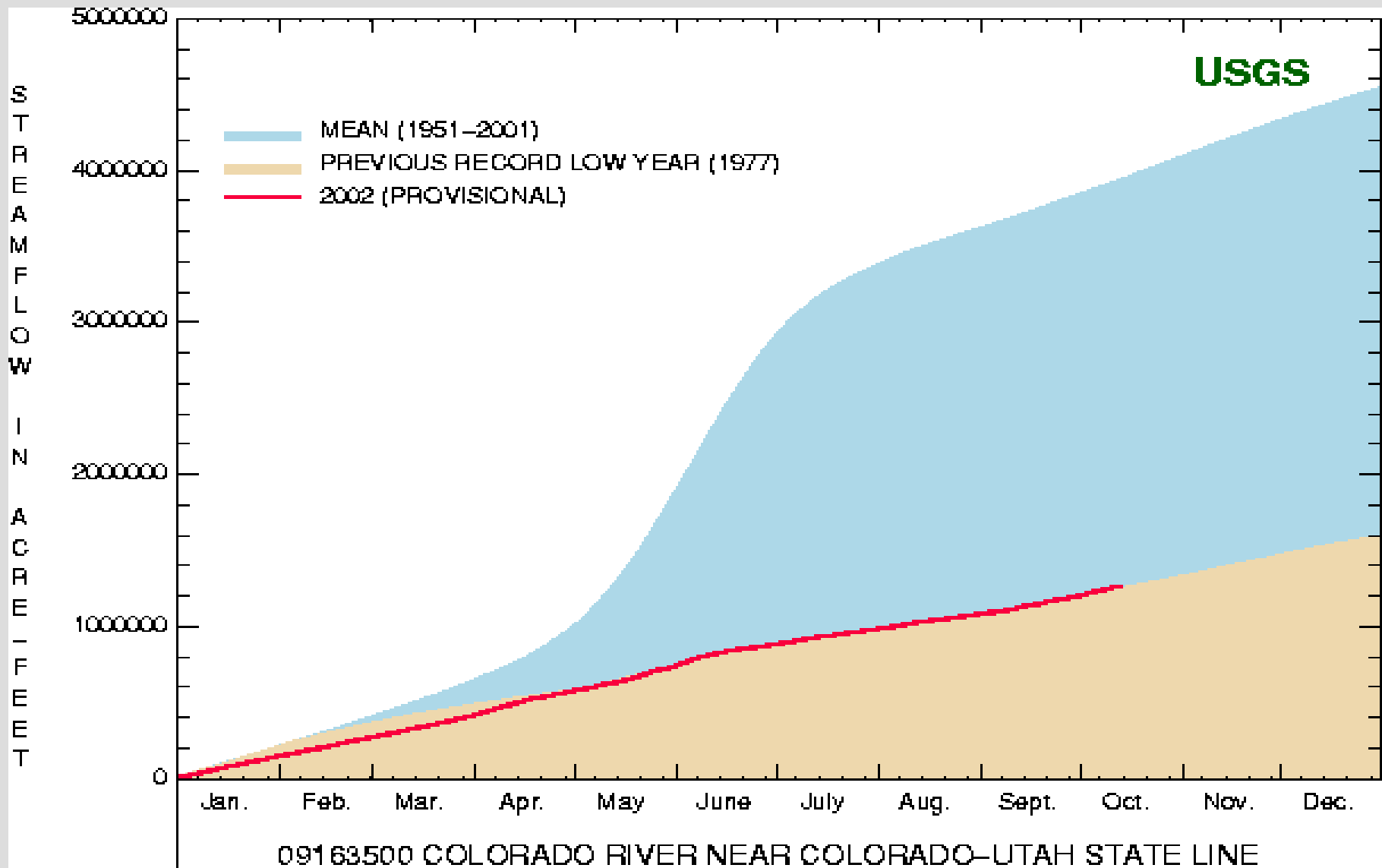


Statewide 2002 snowpack was as 22% of average, precipitation 45-50% average since 1999. 2002 was the worst year since 1703 in the South Platte Basin, the driest conditions since 1579 along the Colorado River based on tree ring studies.

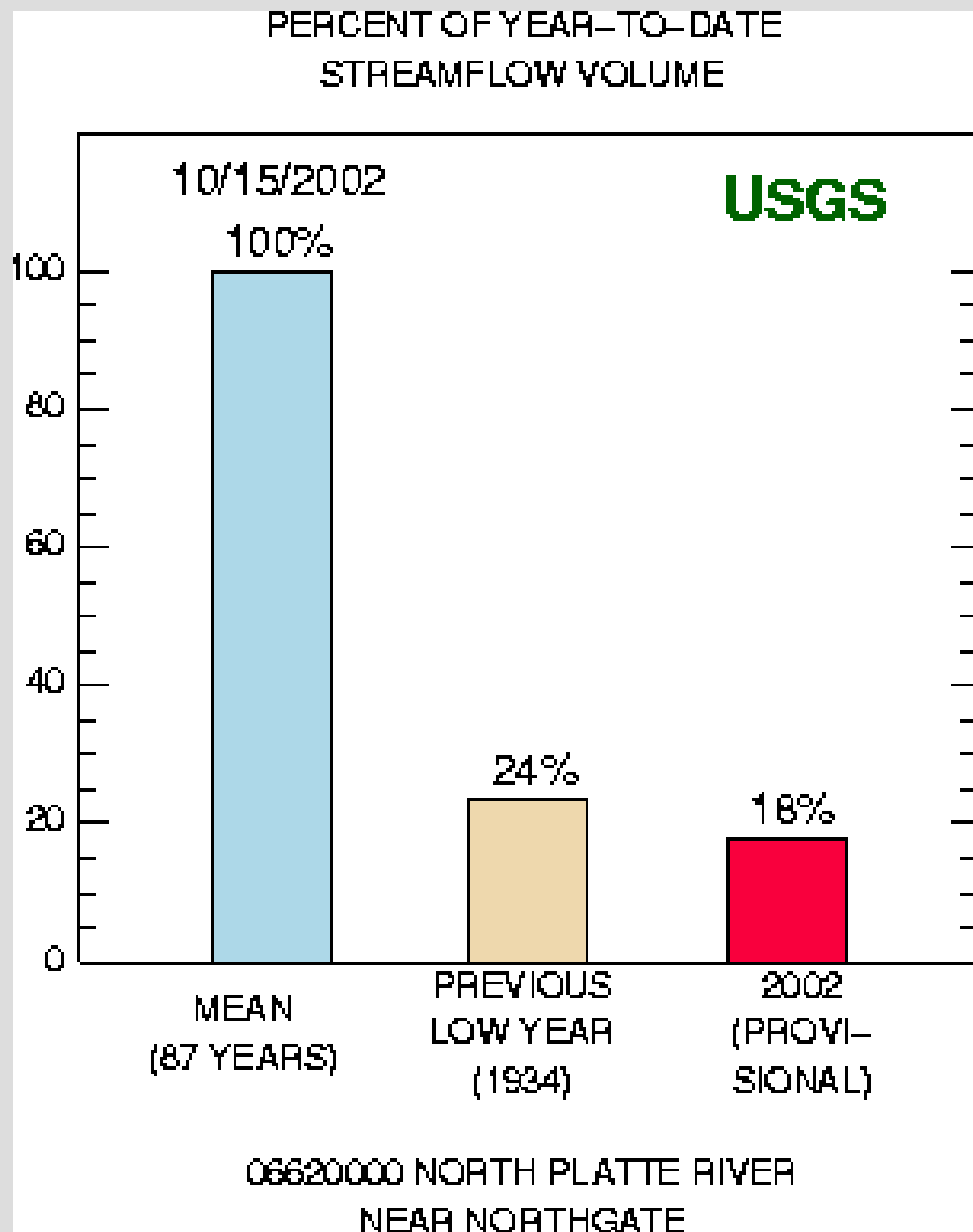




Vallecito Reservoir 2002



Statewide snow melt runoff was about  
30% of normal



Colorado is experiencing a serious but not an unprecedented drought. The State and many municipalities had drought response plans, however the plans didn't consider conditions as severe as encountered in 2002.

# Reservoir Storage

## Current Storage

## Restricted Storage\*

Total a-f (#dams)

Division 1	1,787,810 a-f	33,900 (99)
Division 2	893,544 a-f	89,200 (31)
Division 3	297,261 a-f	9,700 (3)
Division 4	1,447,948 a-f	4,200 (28)
Division 5	1,166,040 a-f	2,990 (19)
Division 6	165,387 a-f	1,400 (11)
Division 7	665,356 a-f	1,460 (7)

<b>Total</b>	<b>6,423,345 a-f</b>	<b>142,850 (198)</b>
--------------	----------------------	----------------------

- August 20, 2002
- **1990-2001 : 49 New dams with a combined storage of 120,000 a-f**
- Div 2 Two Buttes 31,500 a-f and Cucharas 33,000 a-f - very expensive reconstruction necessary.



# Reservoir Storage

**October 1, 2002 statewide Reservoir storage is 48% of average, 56% of 2001. The Colorado River Basin at 42% of average.**

➤ **November 1, 2002 content;**

<b>Blue Mesa Reservoir (940,000 a-f)</b>	<b>260,000 a-f;</b>
<b>Taylor Park (106,000 a-f)</b>	<b>41,000 a-f;</b>
<b>Ridgway (84,000 a-f)</b>	<b>53,000 a-f.</b>

➤ **March 1, 2003 projected content is very bleak.**

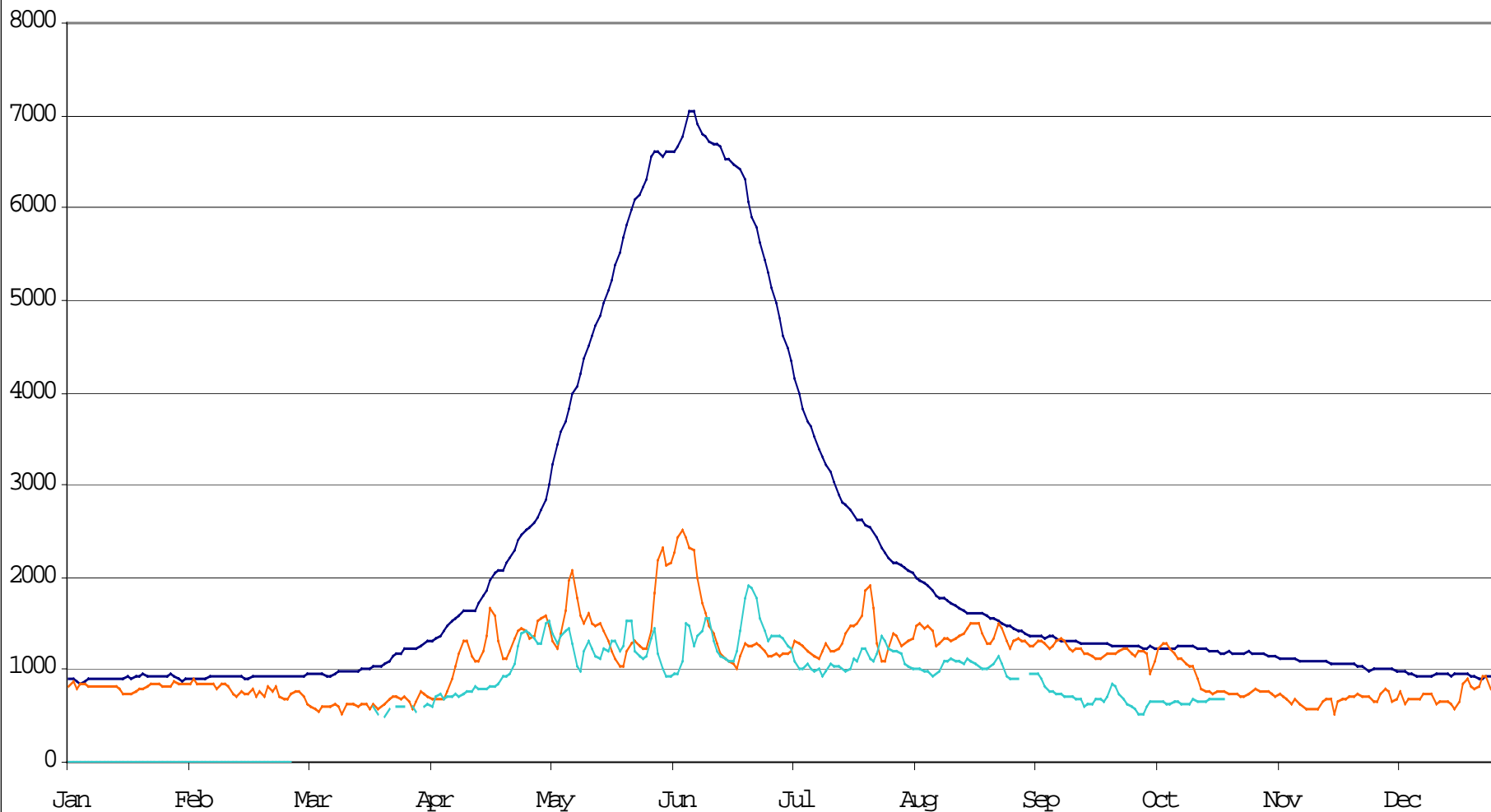
<b>Granby Reservoir (544,000 a-f)</b>	<b>74,000 a-f dead pool</b>
<b>Dillon Reservoir (252,000 a-f)</b>	<b>95,000 a-f.</b>
<b>Green Mountain Reservoir (154,00 a-f)</b>	<b>27,000 a-f. dead pool</b>
<b>Wolford Mountain Reservoir (66,000 a-f)</b>	<b>13,000 a-f.</b>

# Colorado River near Dotsero

MEAN

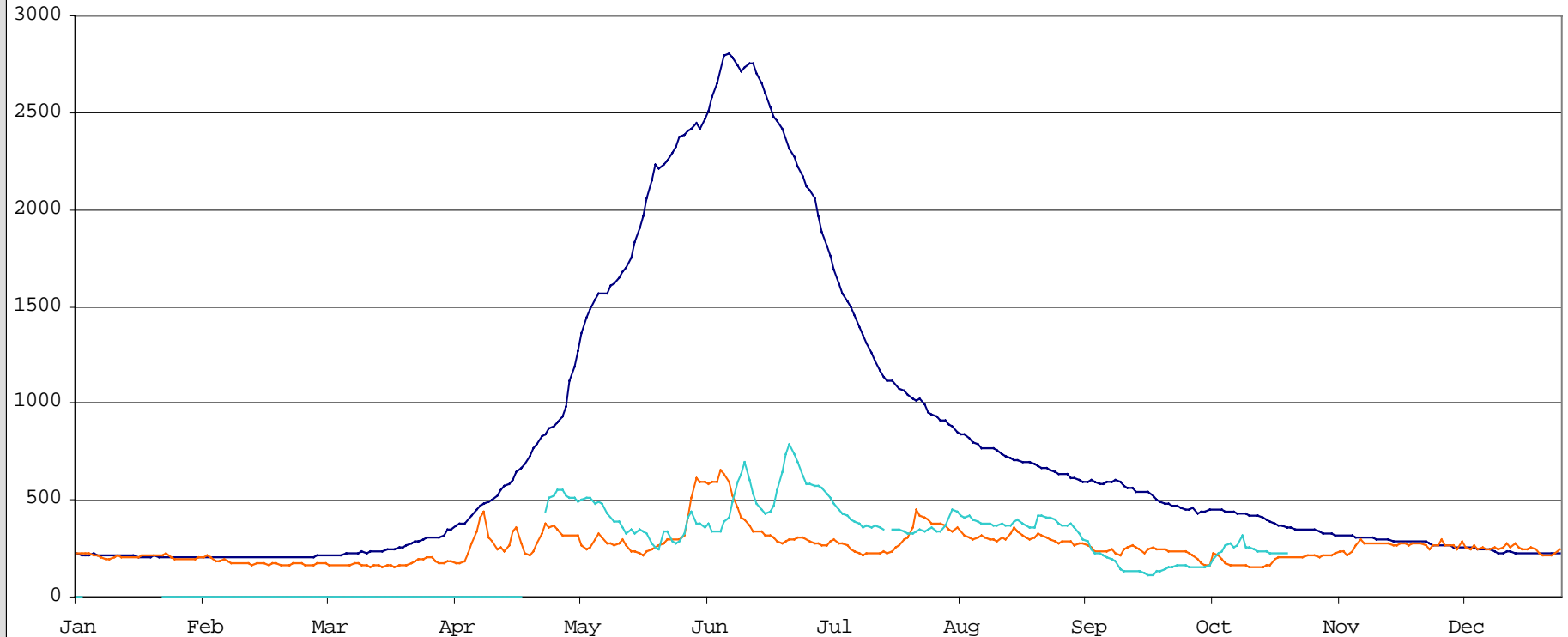
CY-1977

CY-2002



Gunnison River near Gunnison

— MEAN — CY-1977 — CY-2002

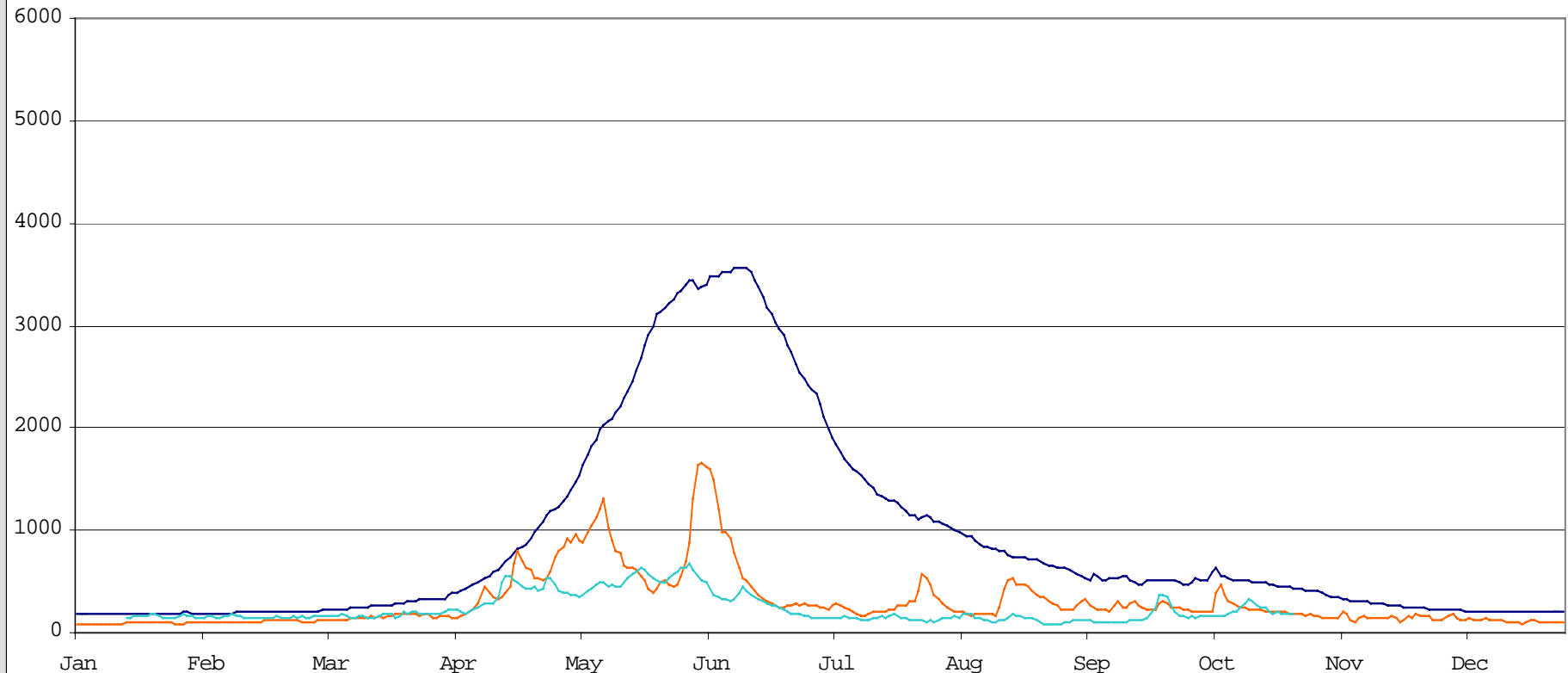


**The Gunnison Tunnel placed a June 1901 call in April 2002 the last call for this water right was in the 1950's drought, prior to the construction of Blue Mesa Reservoir.**

Rio Grande near Del Norte

MEAN

CY-1977



➤ Total flow of the Rio Grande at Del Norte for June was 13,212 acre-feet, 7% of average.

➤ In 1977 June flow was 40,965 acre-feet. Average June flow is 190,316 acre-feet.

## Designated Ground Water Basins

### Crow Creek & Camp Creek Basins

Irrigation and Domestic water is from both **Alluvial and Bedrock Aquifers**. **No surface water supply.**

Lack of precipitation may result in increased pumping and lowering of the water table. This would lead to higher energy and production costs.

### Kiowa-Bijou

Irrigation water supply is from the **Alluvial Aquifer**, **No surface water supply**. Domestic supply from both **Alluvial and Bedrock Aquifers**.

Lack of precipitation may result in increased pumping and lowering of the water table. This would lead to higher energy and production costs.

### Lost Creek

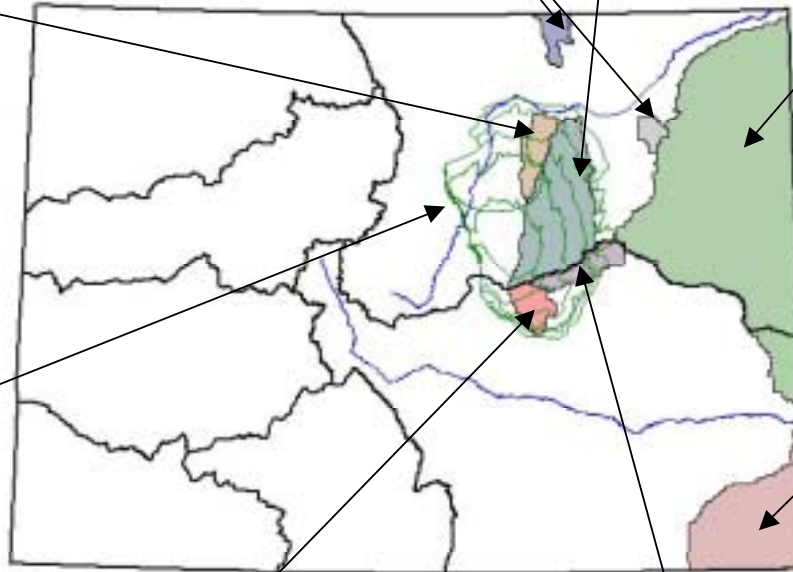
Irrigation and Domestic water is from both **Alluvial and Bedrock Aquifers**. **No surface water supply.**

Lack of precipitation may result in increased pumping and lowering of the water table. This would lead to higher energy and production costs.

### Northern High Plains

Irrigation and domestic water supply is from the **Ogallala Aquifer**. **No surface water supply.**

Lack of precipitation may result in increased pumping and lowering water levels. This would lead to higher energy and production costs.



### Denver Basin

Ground water supply is from the four major Denver Basin Bedrock Aquifers, **Dawson, Denver, Arapahoe and Laramie-Fox Hills**. The aquifers are not part of the surface system and are not affected by drought conditions. However, in times of shortages in the surface water supply, increased use of ground water from the basin can result in accelerated water level declines

### Upper Black Squirrel

Irrigation water supply is from the **Alluvial Aquifer**, **No surface water supply**. Domestic water supply from **Denver Basin Aquifers**

Lack of precipitation may result in increased pumping and lowering of the water table. This would lead to higher energy and production costs.

### Upper Big Sandy

Irrigation water supply is from the **Alluvial Aquifer**, **No surface water supply**. Domestic supply from **Alluvial and Bedrock Aquifers**.

Lack of precipitation may result in increased pumping and lowering of the water table. This would lead to higher energy and production costs.

### Southern High Plains

Irrigation and domestic water supply is from the **Ogallala, Dakota, Cheyenne and Docum Aquifers**. **No surface water supply**

Lack of precipitation may result in increased pumping and lowering water levels. This would lead to higher energy and production costs.

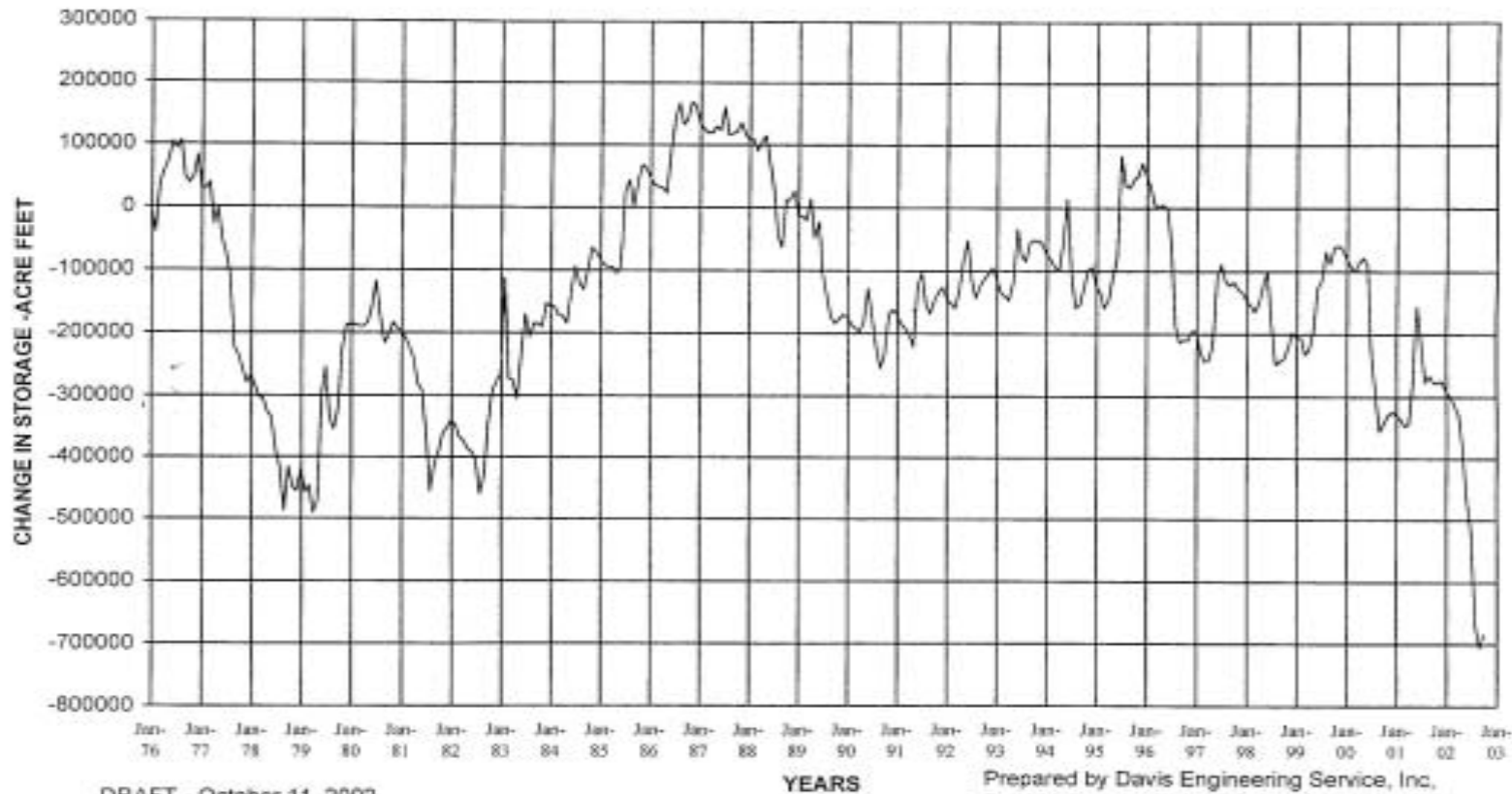


## GROUND WATER USE

<u>Aquifer</u>	<u>Average Annual Supply (Acre-Feet)</u>
Denver Basin	70,000
South Platte Alluvium	300,000
Arkansas River Alluvium	200,000
San Luis Valley Aquifers	380,000
High Plains - Ogallala	1,000,000
Bedrock Aquifers - Mountains	50,000
<b>Total</b>	<b>2,000,000</b>

Groundwater use increased, year to date we have processed twice the average annual permit applications for replacement wells.

**CHANGE IN UNCONFINED AQUIFER STORAGE  
WEST CENTRAL SAN LUIS VALLEY**



➤ The unconfined aquifer of the Closed Basin lost record storage during 2002. 700,000 acre feet below the base storage level. Recent measurements indicate some recovery.

# **Drought Impacts**

- **Calls were placed early in April and continue with the calls being more senior as the summer progresses. The Farmers Independent 11-22-1865 call in District 2 is the most senior call in 35 years in this reach of the South Platte.**
- **The plains irrigation reservoirs east of Denver were empty by the end of August.**
- **Well augmentation entities have had to continuously acquire additional augmentation water to deal with the extended call period resulting in a reduction of allowable pumping by 25%, some well pumping was curtailed to prevent violation of compact delivery requirements.**
- **A call this senior has not been seen before and it called out the City of Pueblo's 1874 direct flow right for 45 cfs which was the cities drought reserve water supply.**
- **Over 20 communities had shortages or have experienced water supply emergencies requiring special actions and include Rocky Ford, Beulah, Victor, Cripple Creek and Penrose. Many municipalities implemented restrictions on outside water use. Nearly all communities implemented some water use restrictions.**



Glenwood Springs 2002

- **\$1.1 Billion impact to agriculture, tourism and recreation industries.**
- **Dryland farmers wheat production, 36 million bushels, 45% ten year average, about 30% of plantings abandoned.**
- **Irrigated corn production varies across the state from 50-85% of average.**
- **Estimate reduction of 40-50% of breeding stock, losses of \$460 million.**
- **Outfitters estimate visitation down 40%, a projected \$25 million impact.**
- **2007 wildfires, 500,000 acres, \$200 million impact.**
- **Rural community business impact significant but hard to define.**
- **Fishing license sales down 93,000 about \$800,000.**
- **Flat water recreation impacts substantial.**



# Summary

- ✓ **Current conditions are extremely serious!**
- ✓ **The State planning and response,**
  - ✓ **1999 Flood and Drought Conference**
  - ✓ **2001 State Drought Plan Update**
  - ✓ **Water Availability Task Force (a.k.a. Drought Task Force)**
  - ✓ **Impact Task Forces convene and mitigation measures implemented**
  - ✓ **Drought and Water Supply Assessment**
  - ✓ **Statewide Water Supply Initiative**
- ✓ **Cooperation in 2002 was very helpful!**
- ✓ **Next year's water supply?**
  - ✓ **El Nino ???? Positive outlook**
  - ✓ **Less than average snowpack/runoff some large metropolitan water providers will be in-house use only in 2003**

## ✓ **Long-Term Possibilities:**

- ✓ **Water Project Development,**
- ✓ **Maximize Existing Water Resources,**
- ✓ **Forest Management,**
- ✓ **Non-native vegetation Management**

## ✓ **Legislation**

- ✓ **Interruptible Water Supply,**
- ✓ **Emergency Drinking Water Wells**
- ✓ **Potential for 90 water bills to be introduced this session; water conservation, storage, representation, well inspection, and..??**



October 1, 2002

# Questions?



# The End